

REMARKS/ARGUMENTS

Applicants thank the Examiner for granting a telephonic interview on February 10, 2004. These remarks are in response to the Office Action dated December 19, 2003 and to the issues discussed during the interview. Claims 1-21 are pending in the present application.

Rejections under 35 U.S.C. §102

In the Office Action, the Examiner rejected claims 1, 2, 7, 9, 10, 15, 17 and 18 under 35 U.S.C. §102(b) as being anticipated by Josten et al. (U.S. Patent No. 5,546,579). In so doing, the Examiner stated:

Regarding claims 1, 9 and 17, Josten et al. teaches a method, computer readable medium, and system for optimizing command execution in a database system, wherein data records are stored on a plurality of data pages therein (col. 5, line 65-col. 6, line 6), the method comprising the steps of:

- (a) providing an identifier to each data page, the identifier indicating when any of the data records contained therein were last modified (col. 7, lines 42-59);
- (b) selecting a data record from a data page (col. 8, lines 1-24);
- (c) copying the selected data record to a second storage area (col. 8, lines 40-52);
- (d) verifying that the selected data record has not been modified since the time that it was copied to the second storage area based upon the identifier (col. 8, line 65-col. 9, line 9); and
- (e) executing the command (col. 14, lines 11-19).

Applicants respectfully disagree.

The present invention is directed to optimizing command execution in a relational database management system RDBMS where data records are stored in data pages. According to the present invention, each data page is provided with an identifier which indicates when the page was modified last. Thus, whenever a record on the data page is modified, the identifier necessarily changes. When the RDBMS receives a command to access a data record on a data page, such as an UPDATE or DELETE command, the system copies the selected data record

from the page, along with the page's identifier, and stores them temporarily in a secondary storage area.

The system uses the stored identifier to verify that the copied record has not been modified during the period in which it was copied and stored. For instance, the system compares the stored identifier with a current identifier for the page. If the page has not been modified, the stored identifier and the current identifier will match, and the system can conclude that the stored data record matches the current record in the database. Accordingly, when the identifiers match, the system is not required to compare the data record in the temporary copy with the record in the current table, which can be a costly event if the records are extensive.

By providing each data page with the identifier and then storing the identifier with the data record in the secondary storage, the RDBMS can quickly and easily determine whether the data page containing the stored data record was modified by comparing identifiers. Accordingly, the present invention minimizes the number of times the RDBMS must go into the data page itself to verify that the stored record is consistent with the current record.

In contrast, Josten is directed to a method for ensuring data coherence in a multisystem shared disk environment, such as a Sysplex. In Josten, each system detects whether a locally cached copy of a data page is invalid, and if it is, the system refreshes the page from a shared electronic store ("SES"). (Abstact). Applicants respectfully submit that Josten fails to teach or suggest "providing an identifier to each data page," as recited in claims 1 and 9, and "means for providing an identifier on each data page," as recited in claim 17, where the identifier indicates "when any of the data records contained therein were last modified."

According to the Office Action, the identifier of the present invention is taught by Josten's data element name which identifies the name of the data page. (Column 7, lines 42-59). During the interview, the Examiner confirmed this interpretation of Josten. Applicants

respectfully disagree. In the present invention, the identifier on each data page indicates *when* the page was modified last. Accordingly, by comparing the stored identifier with the current identifier on the data page, the present invention can immediately determine whether there is a possibility that the stored data record may have been modified.

Josten's data element name merely indicates the name of the data page. The name is registered in the SES and is used to control multisystem data coherence for the data element. (Column 7, lines 44-55). Nothing in Josten teaches or suggests that the data element name indicates "when any of the data records contained therein were last modified." Rather the data element name identifies the particular data page and nothing more. Accordingly, Applicants respectfully submit that Josten fails to teach or suggest the cooperation of elements recited in claims 1, 9 and 17.

Moreover, even if Josten's data element name could be construed to teach the present invention's identifier, which it does not, Josten fails to teach or suggest "verifying that the selected data record has not been modified since the time that it was copied to the second storage area *based upon the identifier*," as recited in claims 1 and 9, and "means for verifying that the selected data record has not been modified since the time that it was copied to the second storage area by determining that the stored identifier is the same as the current identifier from the data page," as recited in claim 17. In Josten, each system in the multisystem environment stores data pages in a local cache buffer. Each local cache buffer is associated with a local validation vector (LVV). The LVV "contain[s] a single validation bit entry for each data page" in the local cache buffer. The bit entry is either "valid" or "invalid." When the system receives a request to access a data page stored in its local cache buffer, the system checks the LVV for the validation bit entry corresponding to the requested data page to determine whether the data page is stale. (Column 8, lines 1-37).

Josten *does not* verify that the requested data record has not been modified since the time that it was copied to the SES based upon the *data element name*; rather Josten checks a validation bit entry in the LVV. Accordingly, Applicants respectfully submit that Josten fails to teach or suggest “verifying that the selected data record has not been modified since the time that it was copied to the second storage area *based upon the identifier*,” as recited in claims 1 and 9, and “means for verifying that the selected data record has not been modified since the time that it was copied to the second storage area by determining that the stored identifier is the same as the current identifier from the data page,” as recited in claim 17.

For the foregoing reasons, Applicants respectfully submit that claims 1, 9 and 17 are allowable over Josten. Claims 2, 7, 10, 15 and 18 depend on claims 1, 9 and 17, respectively, and therefore, the above arguments apply with full force. Thus, claims 2, 7, 10, 15 and 18 are also allowable over Josten.

Rejections under 35 U.S.C. §103

The Examiner rejected claims 3, 4, 11 and 12 under 35 U.S.C. §103(a) as being unpatentable over Josten, as applied to claims 1, 2, 7, 9, 10, 15, 17 and 18 in view of Josten et al. (U.S. Patent No. 5,574,902) (“Josten ‘902”). Claims 5, 14 and 21 were rejected as being unpatentable over Josten in view of Josten ‘902 and further in view of Ponnekanti (U.S. Patent No. 6,591,269). Claims 6, 13 and 20 were rejected as being unpatentable over Josten in view of Josten ‘902 and further in view of Bhide et al. (U.S. Patent No. 5,440,727). Finally, claims 8, 16 and 19 were rejected as being unpatentable over Josten in view of Ponnekanti. Applicants respectfully submit that claims 3-6, 8, 11-14, 16, 19, 20 and 21 depend on claims 1, 9, and 17, respectively, and that the arguments with respect to claims 1, 9 and 17 apply with full force.

Josten '902 is directed to an method for determining the set of buffer pool database pages that must be externalized to stable storage and for scheduling their write I/O's before release of a committing transaction's locks. (Abstract). Ponnekanti is directed to performing an online rebuild of a B+ tree index by copying the index rows to newly allocated pages in the key order so that good space utilization and clustering are achieved. (Abstract). Bhide is directed to maintaining one or more secondary replicas of a partition by spooling modified pages from the primary replica to the secondary replicas rather than by using a synchronous page update or by sending log entries instead of entire pages. (Abstract).

None of the references above teaches or suggests "providing an identifier to each data page," as recited in claims 1 and 9, and "means for providing an identifier on each data page," as recited in claim 17, where the identifier indicates "when any of the data records contained therein were last modified." Moreover they fail to teach or suggest "verifying that the selected data record has not been modified since the time that it was copied to the second storage area *based upon the identifier*," as recited in claims 1 and 9, and "means for verifying that the selected data record has not been modified since the time that it was copied to the second storage area by determining that the stored identifier is the same as the current identifier from the data page," as recited in claim 17. Accordingly, Applicants respectfully submit that claims 3-6, 8, 11-14, 16, 19, 20 and 21 are allowable over the cited references.

Conclusion

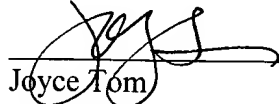
In view of the foregoing, Applicants submit that claims 1-21 are allowable over the cited references. Applicants respectfully request reconsideration and allowance of the claims as now presented.

Applicants' attorney believes that this application is in condition for allowance. Should any unresolved issues remain, Examiner is invited to call Applicant's attorney at the telephone number indicated below.

Respectfully submitted,
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Date



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